

3. SALIENT CHARACTERISTICS.

3.1 Performance requirements. The termini listed in Table 1 shall meet the performance requirements specified in Table 2 when tested with fiber optic connectors that conform to CID A-A-00159.

Note: The U.S. Government preferred system of measurement is the metric SI system. However, since this item was originally designed using inch-pound units of measurement, in the event of conflict between the metric and inch-pound units, the inch-pound units shall take precedence.

Table 2. Termini Test Procedures and Performance Requirements

Test Procedure <u>11</u> /	Performance Requirement
Group I Tests: Visual/Dimensional/Optical	
• Size (EIA/TIA-455-13)	Dimensions per Appendix B; <u>7</u> / <u>10</u> /
• Workmanship (EIA/TIA-455-13)	No pits, burs, etc.; mates properly; <u>1</u> / <u>7</u> /
• Circular Runout (TIA/EIA-455-135)	Inside/outside diameter circular runout within 1 micron (0.00004 in.); <u>7</u> /
• Insertion Loss (TIA/EIA-455-34, Methods A1 and B)	MM: 0.5 dB avg, 0.75 dB max <u>2</u> / <u>8</u> / SM: 0.5 dB avg, 0.75 dB max <u>2</u> / <u>8</u> / SM: 0.25 dB avg, 0.5 dB max <u>2</u> / <u>9</u> /
• Return Loss (EIA/TIA-455-107)	MM: None SM: 30 dB min <u>2</u> / <u>8</u> / SM: 40 dB min <u>2</u> / <u>9</u> /
Group II Tests: Mechanical	
• Single Fiber Cable Pull Out Force (EIA-455-6, axial load \geq 10 kg (22 lb) for 1 minute; one termini pair at a time)	<u>2</u> / <u>3</u> / <u>7</u> /
• Mating Durability (EIA-455-21, 500 cycles)	<u>1</u> / <u>2</u> / <u>3</u> /
• Return Loss (EIA-455-107)	MM: None SM: 30 dB min <u>2</u> / <u>8</u> / SM: 40 dB min <u>2</u> / <u>9</u> /
• Impact (TIA/EIA-455-2, Method A)	<u>1</u> / <u>2</u> / <u>3</u> /
• Insertion Loss, Maximum (TIA/EIA-455-34, Methods A1 & B)	MM: 1.0 dB avg, 1.25 dB max <u>2</u> / <u>8</u> / SM: 1.0 dB avg, 1.25 dB max <u>2</u> / <u>8</u> / SM: 0.75 dB avg, 1.0 dB max <u>2</u> / <u>9</u> /

Table 2. Termini Test Procedures and Performance Requirements
(Continued)

Test Procedure <u>11</u> /	Performance Requirement
Group III Tests: Environmental	
• Temperature Humidity Cycling (TIA/EIA-455-5, Type 2)	<u>1</u> / <u>2</u> / <u>3</u> /
• Temperature Cycling (EIA/TIA-455-3, -40°C/65°C for 5 cycles)	<u>1</u> / <u>2</u> / <u>3</u> /
• Temperature Life (TIA/EIA-455-4, 110°C for 240 hrs.)	<u>1</u> / <u>2</u> / <u>4</u> /
• Return Loss (EIA-455-107)	MM: None SM: 30 dB min <u>2</u> / <u>8</u> / SM: 40 dB min <u>2</u> / <u>9</u> /
• Insertion Loss, Maximum (TIA/EIA-455-34, Methods A1 & B)	MM: 1.0 dB avg, 1.25 dB max <u>2</u> / <u>8</u> / SM: 1.0 dB avg, 1.25 dB max <u>2</u> / <u>8</u> / SM: 0.75 dB avg, 1.0 dB max <u>2</u> / <u>9</u> /
Group IV Tests: Materials	
• Fungus Resistance (TIA/EIA-455-56)	<u>5</u> /
• Salt Spray (TIA/EIA-455-16, 96 hours at 35°C)	<u>6</u> /

Notes for Table:

1/ No visual evidence of cracking, degradation, deterioration, distortion, separation, corrosion, etc.

2/ A connector pair that is currently approved to NAVSEA Drawing 7379171 is required for this test.

3/ Change in optical transmittance ≤ 0.5 dB both during and after the test per EIA/TIA-455-20.

4/ Change in optical transmittance ≤ 0.5 dB after the test per EIA/TIA-455-20.

5/ Materials shall show no, sparse or very restricted microbial growth and reproduction. Little or no chemical, physical or structural change shall be detectable.

6/ No corrosive effects shall be seen on the termini which could be detrimental its operation.

7/ If also testing candidate connectors per NAVSEA Drawing 7379171 with candidate termini, then these tests are applicable in addition to those specified in NAVSEA Drawing 7379171.

8/ Requirement for average is average value of termini per connector. Values specified are those for standard optical signal level performance.

9/ Requirement for enhanced optical signal level performance. Different/revised polishing procedure must be used. Unless otherwise specified in the contract, tests for performance verification shall be performed to standard performance requirement.

10/ Ferrule hole diameter shall be compatible with multimode optical fiber that conforms to TIA/EIA-492AAA and single mode optical fiber that conforms to TIA/EIA-492CAAA. Termini rear inside diameter shall accommodate an optical fiber buffer with a diameter of 900 ± 50 microns.

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SCALE: NONE	UCI	WT GRP	SHEET	3

REV

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7379172

NAVSEA DRAWING NO.

ESNBS

499

11/ When not specified, optical measurements shall be made at the 1300 nm wavelength window. A minimum of 8 fibers shall be monitored during testing. Each fiber shall be monitored individually with no fiber concatenation allowed. Both single mode and multimode fibers shall be monitored. Optical source launch conditions: For SM fiber use 30 mm diameter mandrel and for MM fiber use 70/70 restricted.

3.2 Ferrule End Face. Ferrule end face configuration shall ensure compliance with insertion loss and return loss requirements after polishing in accordance with MIL-STD-2042.

3.3 Crimp Sleeve. Crimp sleeve shall accept single fiber cable with a maximum outer diameter of 2.4 mm (0.094 inch). The terminus shall meet all requirements when the crimp sleeve is assembled to the terminus using a hex crimp die with flats measuring $2.400 \text{ mm} \pm 0.025 \text{ mm}$ ($0.0945 \text{ inch} \pm 0.001 \text{ inch}$) across and 6.60 mm (0.260 inch) maximum long.

3.4 Fabrication Compatibility. Insertion and removal of terminus with respect to the connectors specified in NAVSEA Drawing 7379171 shall be achievable using the approved Navy tool kit described in NAVSEA Drawings 6872813 and 7325763.

3.5 Pin Termini Spring Constant. The mating force shall be a minimum of 5 lb when nominal termini are inserted and mated in a fiber optic connector in accordance with NAVSEA Drawing 7379171.

3.6 Termini Interchangeability. All termini of the same type listed in this NAVSEA Drawing shall be physically and functionally interchangeable without need for modification of such items or of the mating equipment and shall be interoperable with their counterpart termini. Refer to Appendix A for interchangeability test procedures and requirements.

3.7 Sealing. O-ring shall provide a seal between termini and connector insert when immersed in the following fluids and not swell or degrade to the extent of effecting sealing, optical performance, termini insertion and termini removal. Fluids to be compatible with the o-ring are: fuel oil (MIL-F-16884), turbine fuel (JP-5, JP-8 MIL-T-5624), isopropyl alcohol (TT-I-735), hydraulic fluid (MIL-H-17672 and MIL-H-5606), lubricating oil (MIL-L-17331, MIL-L-23699), Chevron Int'l Coolanol 25R (MIL-C-47220 Type IV), sea water (3% NaCl) or the commercial equivalent. O-ring shall provide a seal between the termini and connector insert when immersed in water to an equivalent depth of 9.8 m (32 ft) for a period of 48 hours.

3.8 Materials.

3.8.1 Ferrule: ceramic.

3.8.2 Body: stainless steel, gold plated or nickel plated brass.

3.8.3 Alignment sleeve: ceramic.

3.8.4 O-ring: see sealing requirements.

3.8.5 Retaining clip: see interchangeability requirements.

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SCALE:	NONE	UCI	WT GRP	SHEET 4

3.8.6 Spring: see pin termini spring constant.

3.9 Optical Transmittance Instrumentation Stability. Optical transmittance instrumentation should be subjected to the following stability tests before any testing is performed. The first test should consist of measuring the transmitted power through each channel once every minute for a 4 hour period. The second test should consist of measuring the transmitted power through each channel once every 30 minutes for a 96 hour period. The data for each channel should be analyzed to determine average transmittance, minimum and maximum transmittance, the standard deviation of the transmittance, and the minimum and maximum percent deviation of transmittance.

3.10 Accessories. Each termini shall be packaged with a minimum of one crimp sleeve and one ferrule dust cover.

4. REGULATORY REQUIREMENTS.

4.1 Recovered materials. Products provided are encouraged to be manufactured with recovered materials to the maximum extent practicable, in accordance with paragraph 23.403 of the Federal Acquisition Regulation (FAR).

5. QUALITY ASSURANCE ROVISIONS.

5.1 Interchangeability conformance. As a precursor to market acceptability, the interchangeability requirements in Appendix A of this NAVSEA Drawing shall be met.

5.2 Market acceptability. Termini procured to this NAVSEA Drawing shall have demonstrated commercial market acceptability. Suppliers will demonstrate market acceptability by showing that they have sold more the 200 fiber optic termini with ceramic ferrules to commercial customers and have been selling the product for greater than 2 years.

5.3 Product conformance. The products provided shall meet the salient characteristics of this NAVSEA Drawing, conform to the producer's own drawings, specifications, standards, and quality assurance practices, and be the same product offered for sale in the commercial marketplace. The Government reserves the right to require proof of such conformance.

6. PACKAGING.

6.1 Preservation, packaging, packing and marking shall be as specified in the contract or order (See Ordering data).

7. NOTES.

7.1 Ordering data. Purchasers should specify the following:

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SCALE:	NONE	UCI	WT GRP	SHEET
				5

7.1.1 When Government testing is required. Test samples required to approve termini are as follows:

- (1) Six MM and six SM termini pair (one pin termini and one socket termini = one pair) are to be provided for the tests listed in Table 2 of this NAVSEA Drawing.
- (2) Six additional termini pair (one pin termini and one socket termini = one pair) are to be provided for materials testing which include fungus resistance and salt spray.

7.1.2 Quantity and type of termini required.

7.1.3 When this NAVSEA Drawing is used for procurement, the product conformance clause must appear in the solicitation.

7.1.4 Preservation, packaging, packing and marking requirements.

7.2 Test methods and standards.

- ANSI standards are available from the American National Standards Institute, Attn: Customer Service, 11 West 42nd Street, New York, NY 10036.
- ASTM standards are available from the American Society of Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.
- EIA standards are available from the Electronics Industries Association, Engineering Department, 2001 Eye Street, NW, Washington, DC 20006.
- Federal Government publications are available from the Standardization Documents Order Desk, 700 Robbins Avenue, Philadelphia, PA 19120-5094.
- Fiber Optic Military Specification and related NAVSEA Drawings are available at the following Web Site: <http://www.it-umbrella.navy.mil> (click on the word "Fiber" at the bottom of the Home Page).

7.3 Patent notice. The Government does not have a royalty free license under the following patent for the benefit of manufacturers of the item, either for the Government or for use in equipment to be delivered to the Government.

Patent number

US 4707068

Patent expiration date

11/17/2004

SIZE	CAGE	ESWS	DRAWING NO.	REV
A	53711	499	7379172	—
SCALE:	NONE	UCI	WT GRP	SHEET
				6

APPENDIX A

REMOVABLE TERMINI, FIBER OPTIC, MULTIPLE TERMINI CONNECTOR INTERCHANGEABILITY REQUIREMENTS

Interchangeability. Termini shall be physically and functionally interchangeable without need for modification of such items or of the mating equipment and shall be interoperable with their counterpart NAVSEA Drawing 7379171 connectors. Interchangeability shall be performed on separate components and assemblies than those used for and as a precursor to any quality assurance provisions for market acceptability or product conformance inspections.

1. Interoperability with counterpart connectors. Interoperability of the termini and connector shall be performed as specified in 1a and 1b and Table I.

a. Termini. This test is applicable for candidate termini being considered.

(1) Test sample configuration. Termini from different sources shall be placed in the connectors as specified in Table I. This test is repeated with all previously certified sources of termini that are identified as being interchangeable.

(2) Test performed. Tests shall be performed as specified in 1b using test variations 1 through 3 specified in Table I.

b. Optical performance test for interoperability.

(1) Test method. Test shall be performed to TIA/EIA-455-34, Methods 1A and B. Power meter or test set with a wide area detector and adapters specifically for NAVSEA Drawing termini and ST connector plug interface shall be used. One terminus pigtail shall be used to simulate the pre-cut cable. The terminus is inserted into the termini adapter (at detector end) and a measurement obtained. Next, perform the post-cut cable measurement. The terminus is inserted into the connector plug and mated with the mating terminus in the connector receptacle. The ST connector on the mating terminus pigtail is inserted into the ST connector adapter (at detector end) and a measurement obtained.

(2) Test requirement. The different between the pre-cut and post cut cable measurements shall be ≤ 0.75 dB for MM fiber and ≤ 0.75 dB for SM fiber.

Table I. Interchangeability Test Variations

X = Previously Certified Connector
A = Previously Certified Termini

B = Candidate Termini

Test Variation	Connector Receptacle	Termini Socket	Connector Plug	Termini Pin
1	X	A	X	B
2	X	B	X	A
3	X	B	X	B

2. Termini mechanical test.
 - a. Test sample configuration. Termini shall be placed in the previously certified connectors as specified in Table I. This test is performed to verify conformance to specified termini insert and removal force levels.
 - b. Test performed. Tests shall be performed as specified in 2c and 2d using certified connectors and variation 3 in Table I. Test shall be performed on a minimum of 6 socket termini and 6 pin termini.
 - c. Termini insertion and removal force test.
 - (1) Test method. Non-terminated pin and socket termini shall be inserted into a previously certified connector using a terminus insertion tool and the force required to insert the terminus measured. A terminus removal tool shall then be engaged to unlock the terminus. The terminus shall be removed and the force required to remove the terminus measured.
 - (2) Test requirement. The termini insertion force and the force required to remove unlocked termini shall not exceed 98 N (22.0 lb).
 - d. Termini retention force test.
 - (1) Test method. Test shall be performed on non-terminated pin and socket termini one at a time. Terminus shall be inserted into a previously certified connector. An axial compressive load shall be applied to the front face of the terminus tending to push the terminus to the rear of the connector insert. A pre-load not greater than 13.3 N (3 lb) may be used to seat the terminus for the initial measurement. Axial loads shall be applied at a rate of 4.4 N/s (1.0 lb/s) up to a maximum load 98 N (22.0 lb). The maximum load shall be maintained for a minimum of 5 seconds.
 - (2) Test requirement. Termini shall be retained in their inserts up to a maximum load of 98 N (22.0 lb).
3. Installation and removal tools inspection. Tools used shall be listed on NAVSEA Drawings 6872813 and 7325763. Tools shall be used during termini/connector assembly and testing to verify performance.

APPENDIX B

INTERCHANGEABILITY DIMENSIONS
REMOVABLE TERMINI, FIBER OPTIC, MULTIPLE TERMINI CONNECTOR

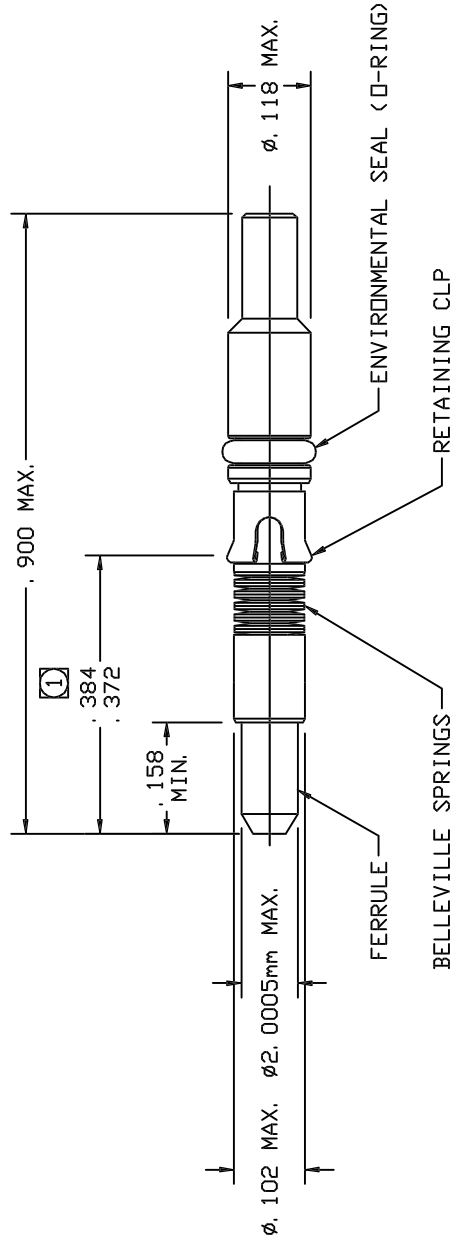
This appendix has the figures with interchangeability dimensions for the termini as listed in the following table:

<u>Figure Number</u>	<u>Description</u>
1	Interchangeability Dimensions For Pin Terminus
2	Interchangeability Dimensions For Socket Terminus
3	Interchangeability Dimensions For Insert Inspection Fixture

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APPENDIX B



2. DIMENSIONS ARE IN INCHES

① THIS DIMENSION USED WHEN TERMINI INSERTED INTO INSERT DIMENSION FIXTURE, SEE FIGURE 3

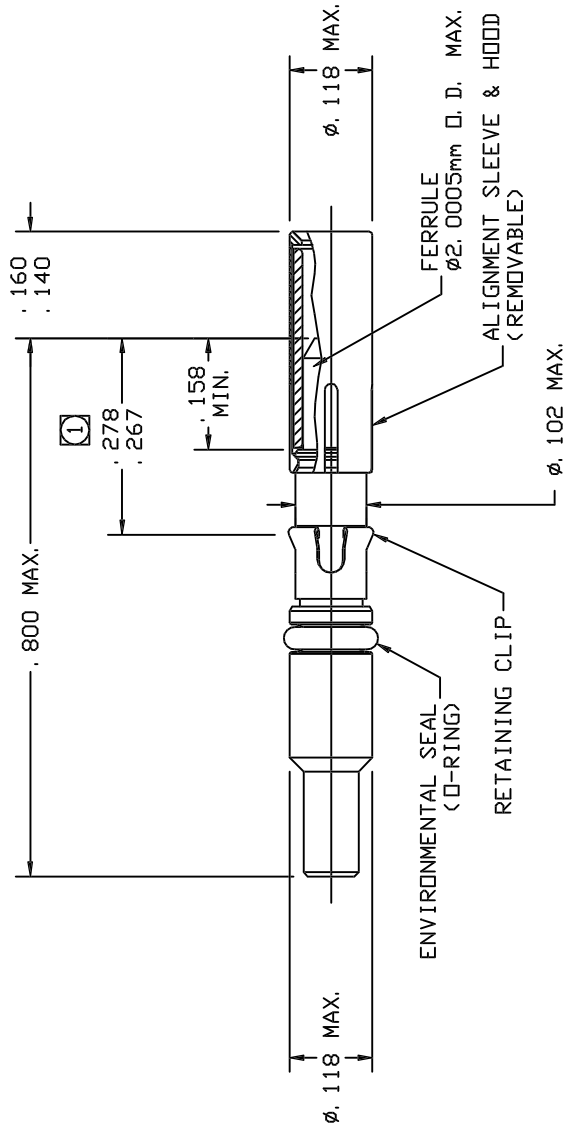
FIGURE 1.
INTERCHANGEABILITY DIMENSIONS FOR
PIN TERMINUS



SIZE A	CAGE 53711	ESWS 499	DRAWING NO. 7379172	REV -
SCALE: NONE	UCI	WT GRP	SHEET 10	



APPENDIX B



2. DIMENSIONS ARE IN INCHES

① THIS DIMENSION USED WHEN TERMINI INSERTED INTO INSERT DIMENSION FIXTURE, SEE FIGURE 3

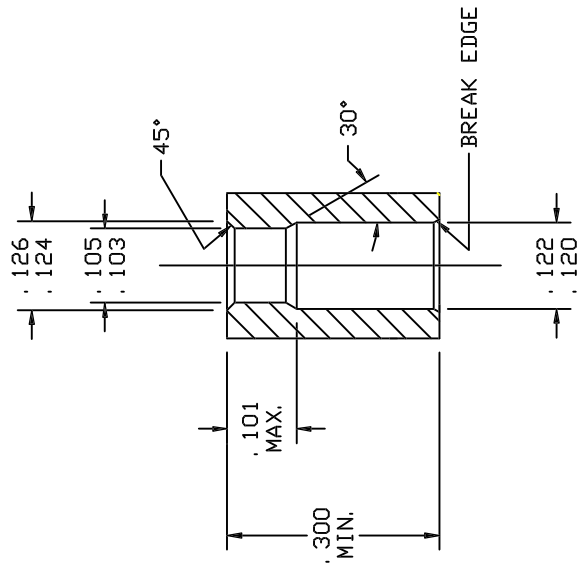
FIGURE 2. INTERCHANGEABILITY DIMENSIONS FOR SOCKET TERMINUS

(SHOWN WITH ALIGNMENT SLEEVE & RETAINING HOOD ASSEMBLED)



SIZE A	CAGE 53711	ESWS 499	DRAWING NO. 7379172	REV -
SCALE: NONE	UCI	WT GRP	SHEET 11	

APPENDIX B



1. DIMENSIONS ARE IN INCHES

FIGURE 3.
INTERCHANGEABILITY DIMENSIONS FOR
INSERT INSPECTION FIXTURE

SIZE A	CAGE 53711	ESWS 499	DRAWING NO. 7379172	REV —
SCALE: NONE	UCI	WT GRP	SHEET 12	